

# **First National Conference/Workshop on Automating Data Collection for Transportation Planning**



1974



Co-sponsors: Florida Department of Transportation and Federal Highway Administration November 6-7, 1974 Orlando, Florida

# IN-MOTION WEIGHING

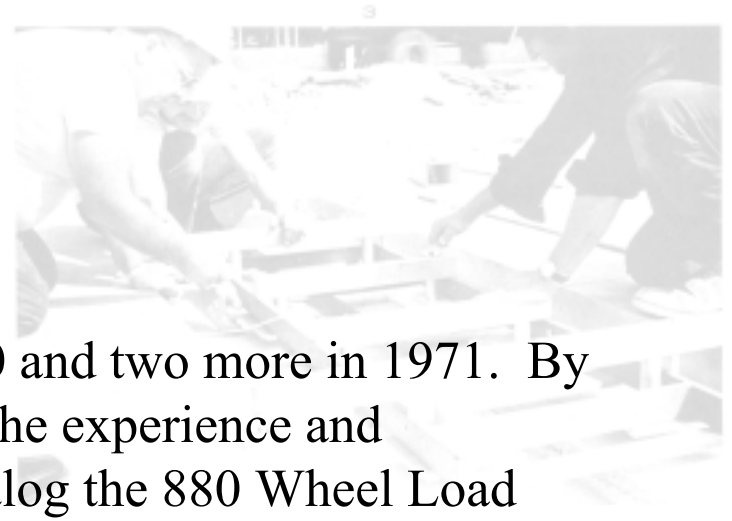


The term weight, by definition, and by common usage, implies that only gravitational force is acting on a body when it is being weighed and that the body is at rest. **The objective of in-motion weighing is to approximate the weight of a vehicle by measuring** instantaneously or during a short period of time **only the vertical component of the dynamic force** that is applied to the road surface by the tires of the vehicle while it is moving horizontally at constant velocity and vertically at zero velocity. The vertical forces exerted on an ideally smooth, level surface by the perfectly round, dynamically balanced, rolling wheels of a vehicle operating in a vacuum are of course equal to the static weight of the vehicle, but in practice, no road surface is ideally smooth and level and no vehicle is perfect. Neither can the existence of the atmosphere be ignored. The nearer actual conditions approach ideal conditions, the better will be the approximation of vehicle weight from measured dynamic vertical tire forces. This must be recognized in designing in-motion weighing systems, in using these systems for field surveys, and in interpreting the resulting data.

“No physical phenomenon, including vehicle weight, can be measured with absolute correctness.”

Measurement tolerances that are feasible to achieve and yet which yield acceptable results must therefore be allowed in practice. In establishing allowable tolerances, the intended use, and thus the required quality, of the information obtained by measurement must be considered along with equipment limitations, costs, safety, and time demands.





California purchased ten Transducers in 1970 and two more in 1971. By the summer of 1971 Rainhart Company had the experience and confidence to face the world at large and catalog the 880 Wheel Load Transducer. We also became the exclusive distributor for Unitech Weigh-in-Motion Systems. By August 1972, a Rainhart Company representative had visited virtually every state department of transportation and explained to planning, research and testing engineers what was being accomplished in Austin. In addition to the Texas Highway Department, four other states now have Weigh-in-Motion Systems. In succession, they are the Kentucky Department of Transportation, Florida Department of Transportation, New Mexico State Highway Department, and Louisiana Department of Highways. The Oklahoma Department of Highways is getting their system this month. **Each has unique circumstances and experiences.**

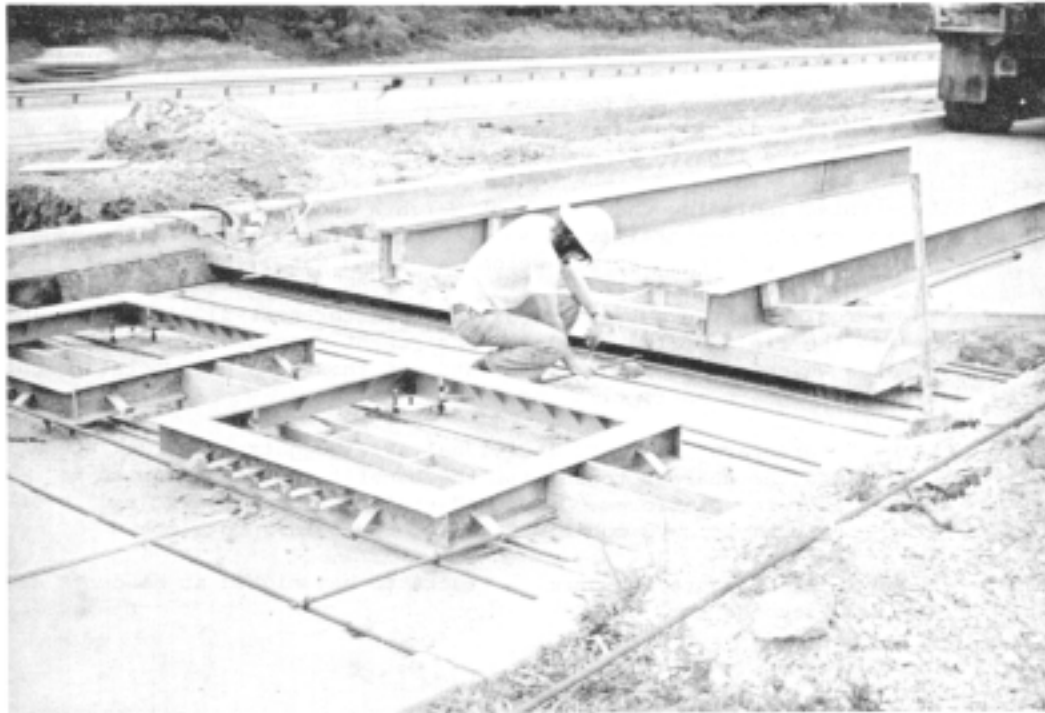
**I should now like to summarize my conclusions, conclusions which we learned, as usual, the hard way. These are the following:**

1. Accurate weighing of individual vehicles at normal highway speeds is not possible due to vehicle pitch and bounce.
2. Data collection on large numbers of vehicles for the purpose of planning appears to be promising, but system resolution need not be better than two to five percent.
3. The hardware part of the system should be rugged and be fastened to the pavement such that it can be left unattended for a long period of time.
4. As far as law enforcement is concerned, high-speed devices can only be used as sorters- the actual weighing should be carried out at low speeds on a 0.1 percent accuracy scale at a truck inspection station equipped with a return loop to recirculate a vehicle if necessary.
5. Data collection is a clandestine operation: the physical presence of the scale, wires, the van housing the data acquisition system and other visible elements should be hidden or be made as inconspicuous as possible. p97

# Maintenance Problems

Maintenance problems fall into several categories. Lack of pride in workmanship and attention to smallest details will cause all levels of maintenance problems. Fortunately we have not had any serious problems caused by lack of attention to detail, but the possibilities are very real. Minor problems have been caused by lack of attention to detail or being in too big a hurry.

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The control section provides the format generation necessary to transmit the stored data to the Central Station. **Transmission rates of 5, 7.5, or 10 characters per second** may be selected by a switch on the Control Board. The first data transmitted is the station identification number followed by the 24 hourly counts from each Counter Board and the clock time. – 135



*R. W. Tweedie:* **I think one of the benefits of this type of meeting** that really doesn't come out in the meeting itself **is the conversations that you have with your counterparts from the other states** and it may not be about weighing trucks but may be about inventory techniques, it may be



about in my case 0 & D Surveys. Fred and I have talked about that. To have that kind of forum I get that at TRB meetings in January in Washington. That's the only time that I ever get that and there is more in the area of research than is in inventory. I think the thing we really need for something like this, is some group to kind of sponsor and organize, not necessarily to run but to organize. Maybe that is the role of the Federal Highway Administration. If they can kind of put the thing together and then draw on the experts in the states as you have done with this meeting quite ably. Then I think we have the kind of forum that we need and we are going to get support from our own states to go to those kind of meetings. p187



In summation, from what I've heard so far. **There appears to be a need for a periodic conference of this sort** with a periodicity most likely no more frequent than two years or perhaps three years. The meeting should not be of a new organization that is sponsored by itself. It should not be a new independent group or organization. if it's an organization at all it should either be sponsored by a state that takes the initiative; or it should be an element of some existing organization in some form.

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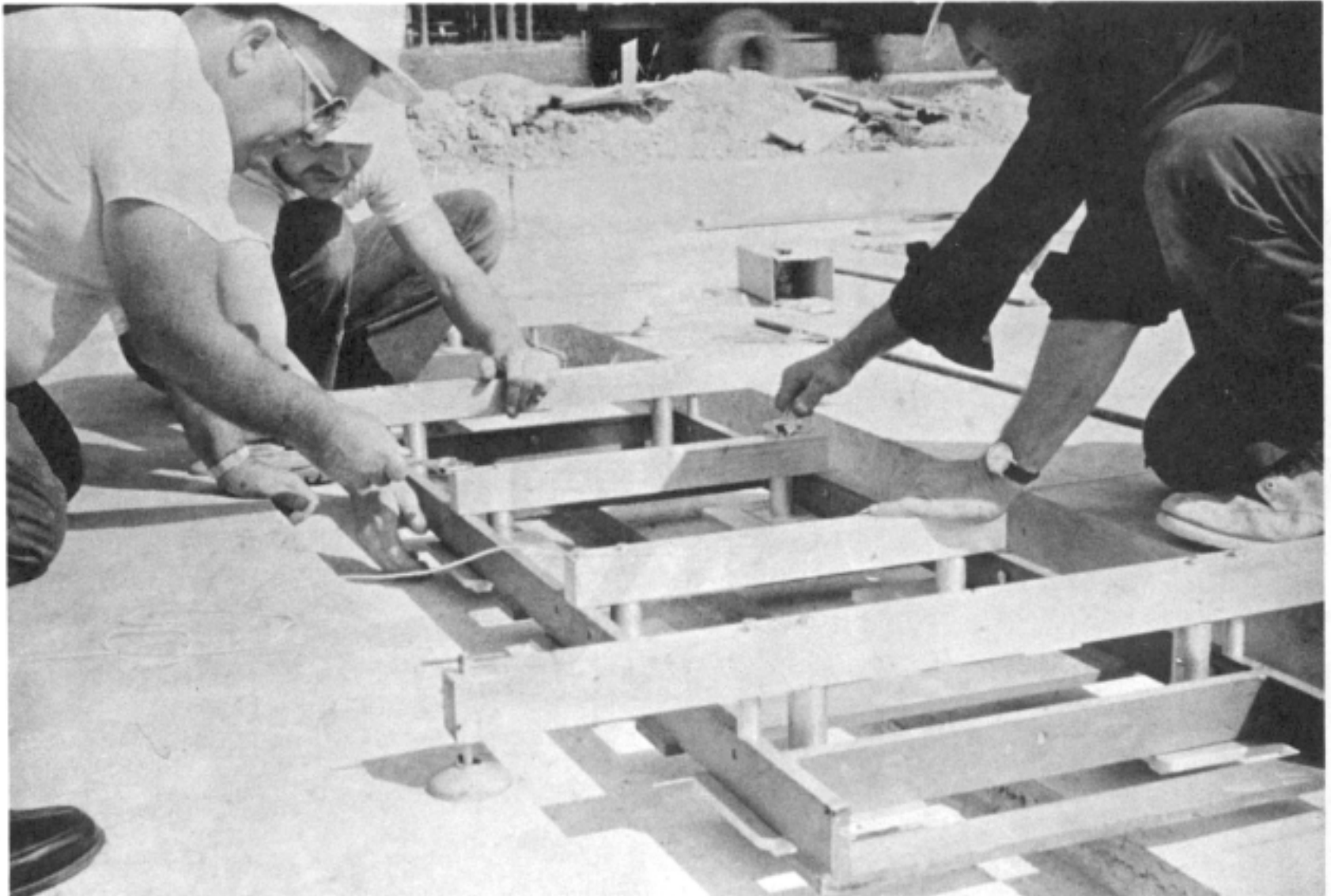
- Accordingly, I am pleased to advise you that the Florida Department of Transportation and the Federal Highway Administration propose to sponsor a National Conference/Workshop on Automating Data Collection for Transportation Planning. **The primary emphasis of this first meeting will be on the topic of in-motion vehicle weighing.** The exact time and location of the meeting are yet to be set, however, a mid-fall meeting **in Orlando, Florida** is the target at this time. It is expected that this meeting will be the first of a series of such national meetings and that it will spawn a national organization (or possible a new committee within an existing body) created to sponsor further meetings, conferences, research, etc. p193



## PENNSYLVANIA'S IN-MOTION TRUCK WEIGHING SYSTEM



2. The first 10" concrete pour is complete. Anchor bolts embedded in the concrete hold frames in proper position. Form work is being installed for the Rainhart frames prior to the second concrete pour.



3. Rainhart frames being placed in position after the second pour. Frames were secured in place by grouting.



5. Dynamic calibration and testing: Large truck carrying standard weights crossing the 42" X 48" Streeter-Amet platforms. The 18" X 53" Rainhart platforms are located 6' down stream from the Streeter-Amet installation.

## PENNSYLVANIA'S IN-MOTION TRUCK WEIGHING SYSTEM



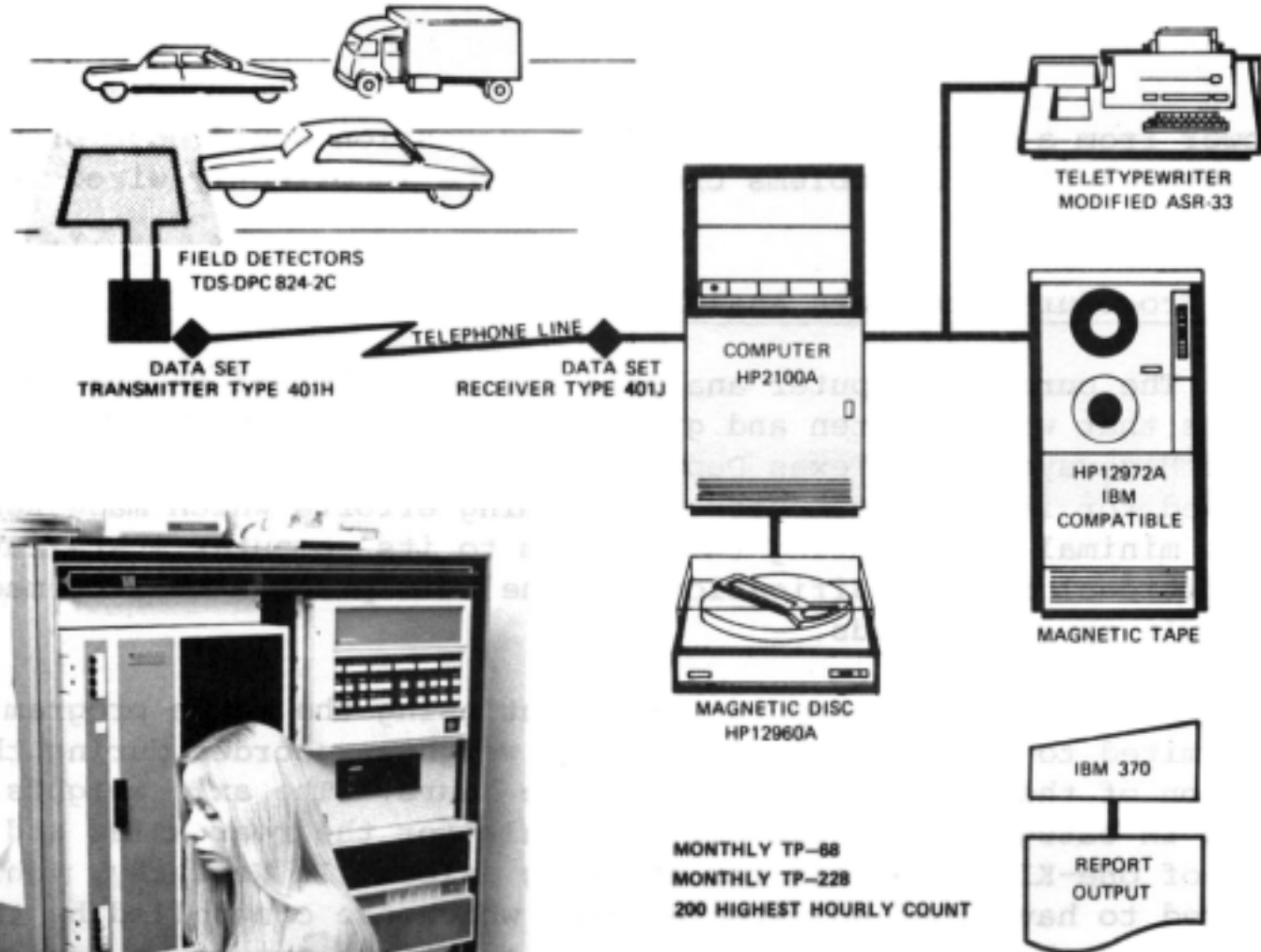
6. Everything including the Bureau of Weights and Measures truck was loaded aboard the Low Boy trailer in an attempt to reach single axle loads of 50,000 lbs. but the heaviest weight achieved was 37,500 lbs.

## PENNSYLVANIA'S IN-MOTION TRUCK WEIGHING SYSTEM

7. The weighing instrument is a modified Streeter-Amet 4120 weigher, located inside the field office trailer. Instrument provided visual displays of axle weights and speed. It prints out this data plus total weight, truck sequence number, time and date.
  8. Large "scoreboard" displays individual axle weights and truck speed in mph (to the nearest tenth) for the benefit of the driver as he passes over the platforms. Standard traffic signal shows "red" over 5 mph, "green" below 3 mph and "amber" of within 3 to 5 mph.
  9. The system configuration permits trucks to be weighed at headways as low as 7 seconds at 5 mph.
1. A 15' X 15' section of 10" concrete slab and 10" of sub-base were removed from the truck exit ramp in a roadside rest area on I-83 near Harrisburg. Streeter-Amet frames are shown mounted in position on a heavy I-Beam in preparation for the first concrete pour. I-Beams placed across the opening provided a simple method for holding scale frames flush with the pavement surface.
4. Static testing: A 5000 lb. standard weight is lowered on the Rainhart platform.



FLORIDA DEPARTMENT OF TRANSPORTATION – DATA FLOW – TRAFFIC COUNT TELEMETRY SYSTEM.



TRAFFIC COUNTS UNIT      SEPT. 1974



Session II :  
Traffic Count  
Telemetry Systems





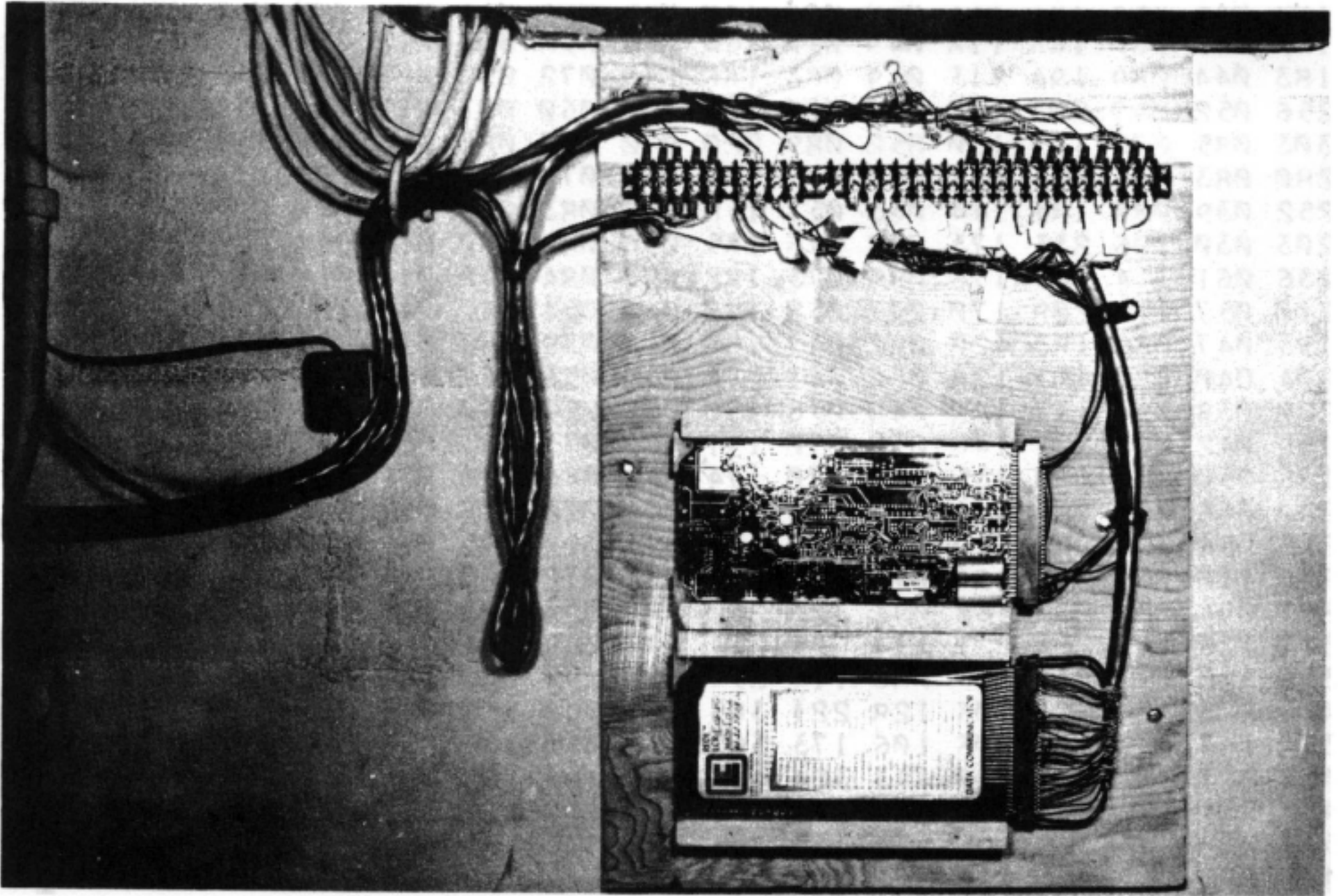
Session I : Weigh-in-Motion



## TYPICAL URBAN MINICOMPUTER INSTALLATIONS



*PDC-808 minicomputer and model 103A dataphone.*



*Demultiplexing equipment feeding counts from leased local phone line into minicomputer for temporary storage.*





Session V : General

